

# NCTE-Readout Unit Manual



Thank you for choosing our product!

This manual supports you in the correct handling as well as the careful use of the described services.

The information contained in this manual has been compiled with the greatest possible care by our specialists, but excludes legal obligations in the sense of commercial law. Information on specific properties or suitability for particular applications cannot be derived. Unauthorised modifications by the user also mean possible damage to the device, for which NCTE cannot be held liable. NCTE reserves the right to make changes to the product without prior notice.

- Read these instructions carefully and follow their instructions.
- Pay particular attention to danger signs and hazard warnings:



## ATTENTION!

Non-observance may cause damage to hardware and software or impair the function.



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## 1. Safety instructions and assembly recommendations

### 1.1. Safety instructions

- Please read the instructions carefully before first use.
- Make sure that all cables are properly connected and connected before each use.
- Make sure that the existing conditions of use match those of the device (power supply, max. current consumption, temperature).
- Disconnect the readout unit from the power supply before making any changes to cable connections or device adjustments.

### 1.2. Setup recommendations / operating environment

In the event of unexpected malfunctions during operation, we recommend the following advice:

- Remove/reduce metallic objects which are in the immediate vicinity of the measurement.
- If possible, do not operate any devices on the same line if a corresponding voltage filter is not available.
- Please use only shielded cables of sensor and readout unit (scope of delivery).
- When using power supplies, use cables with twisted pairs of wires (shielded with aluminium/metal braiding against electromagnetic fields).
- Avoid nearby power lines that can cause possible interference with the measurement results.
- If possible, avoid proximity to devices with high electromagnetic radiation.



## 2. General

### 2.1. Device description

The readout unit is a multifunctional device to display measurement results of torques. In addition to the possibility of torque measurement, angles or speed can also be determined due to additional inputs. The readout unit has two programmable relay connections and two connections that can be used for recording measurement results.

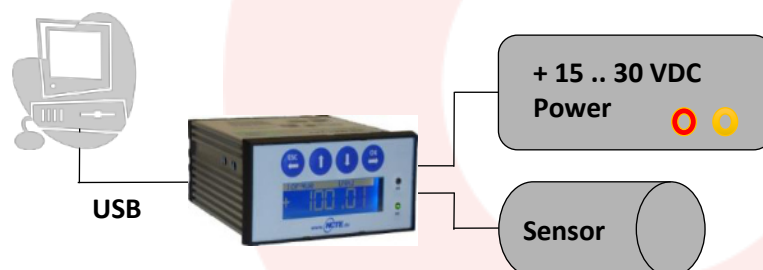
The readout unit has a LCD display with 4 pushbuttons for easy and user-friendly operation.

By means of the available USB port, settings and acquired measured values are easily transferred directly to the PC (data recording in real time, saving to a file).

The readout unit has an SD card slot (SD/SDHC) on the back, where recorded measurement data can be stored (clocking from 10 ms to 1 hour). The integrated real-time clock also allows the measurement results to be stored with the current time and date.

### 2.2. Properties

- Power supply 15 ... 30 VDC
- compatible to all NCTE torque sensors with analog signal, 0 ... 10V - input
- counter input for incremental protractors or signal types UP-DOWN/STEP DIRECTION
- Recording possibility of min./max. measured values
- Data storage with programmable time interval from 10 ms to 1 hour
- Memory card slot for SD/SDHC cards to store measurement results
- 2 digital inputs for external control
- 2 relay outputs for control of external devices
- USB port for communication with PC
- LCD display with 4 push buttons
- Robust aluminium housing - IP40 protection class

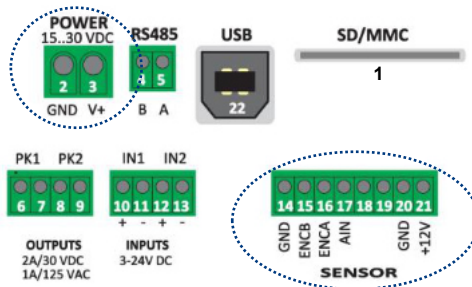




2.3. Overview / description – front side of the device

Function	Description
LEFT/ESC	Pushbuttons for menu control to confirm or undo selected settings.
UP	
DOWN	
RIGHT/OK	
Display	LCD display
Diode LED D1	Diode for active data measurement recording
Diode LED D2	Diode for activity of the measured value conversion

2.4. Overview / description – rear side of the device



No.	Function	Description	Note
1	SD/MMC-Anschluss		
2	GND	Supply voltage for the unit	
3	V+	Supply voltage for the unit	15...30 VDC
4	n. c.		Not supported
5	n. c.		
6	OUT 1	Relay 1	Relay outputs / max. voltage: 1A/125 VAC, 2A/30 VDC
7	OUT 1	Relay 1 – open output	
8	OUT 2	Relay 2	
9	OUT 2	Relay 2 – open output	
10	IN 1 +	Dig. input 1 plus	Digital inputs: low level <1 V high level 3...24 V
11	IN 1 -	Dig. input 1 minus	
12	IN 2 +	Dig. input 2 plus	
13	IN 2 -	Dig. input 2 minus	
14	a. GND	Ground analog signal	
15	ENC B	B input counter (angle measurement – channel B)	Quadrature input, TTL 5 V
16	ENC A	A input counter (angle measurement – channel A)	
17	A IN	Analog sensor signal	0 .. 10 V
18	n. c.		
19	n. c.		
20	GND	Ground	
21	+12 V	Supply voltage sensor	Max. 100 mA
22	USB-port, type B		



### 2.4.1. Supply voltage

The readout unit is to be operated with constant voltage of 15...30 VDC.



#### **ATTENTION!**

Reversing the polarity or exceeding the maximum specified voltage will damage the readout unit.

### 2.4.2. USB port

The readout unit is equipped with a USB port (type B). The unit is connected to the PC by means of an ordinary USB cable (A-B). When the readout unit is connected to the PC, the unit can be configured, recorded data can be saved graphically and in real time as a file.

The unit also works without connection to the PC - then as a stand-alone device.



#### **NOTES!**

The USB port may be sensitive to interference in power supplies and electromagnetic fields in industrial facilities.

In cases of data transmission problems, we recommend the following advice:



- Power supply of the readout unit via another/separate power supply.
- Use a line filter before the power supply input.
- When using USB connection cables with a length of <1.5 m, use versions with a ferrite core if possible.
- Use of external hubs; USB connection on the PC.

Under certain conditions, communication may also be interrupted without notice.

### 2.4.3. Relay outputs

The readout unit contains two independent, software-controlled relay outputs (PK1 u. PK2) for general use.



#### 2.4.4. IN1/IN2 digital inputs

The readout unit is equipped with two external inputs, which can be used to acquire or stop measurements depending on the operating status.

Trigger mode	IN1-input	IN2-input
Continuous	-	-
IN1 on / IN2 off	Starting the measured value acquisition	Stopping the measured value acquisition
IN1 high level	Capture/stop the measurement	-

High input values mean a voltage in the range of 3...24 V at 1 ms.

#### 2.4.5. Sensor input

This input is used to connect the analog output of the torque sensor.

#### 2.4.6. Encoder input

This input is used for externally detected revolutions at standard 0-5 V (TTL).

For 24 V signals, resistors of ENCA, ENCB series with 1.5 kΩ (1...2.2 kΩ) should be included.

This input can work with two modes:

- ENCODER mode (A/B) - when using angle sensors with A/B output. It is recommended to use angle sensors with TTL signal or 5 volt line amplifier outputs.
- Speed sensor (A) - incoming pulses increase the counter. The direction is not detected.

The readout unit also has the ability to record speeds at the counter input.

The speed can be displayed in the following units:

- X/second (speed update every 100 ms.)
- X/minute (speed update every 1 sec.)
- X/hour (speed update every 1 min.)



### 3. Display / LCD display

In the main menu of the readout unit, various information on different settings is displayed. Switching between the modes is done with the keys  $\downarrow$  and  $\uparrow$ . The basic settings (after switching on the unit) are made under Options (Main settings -> Display selection).

Pressing and holding the ESC key ( $\ominus$ ) with the position selected within 3 seconds, allows quick access to functions such as tare setting or speed counter reset.

Displayable information:

#### Torque

The display shows the current value of the incoming torque in the selected unit.

(Nm – Newton meter, Ncm – Newton centimetre)

Press ESC Key  $\ominus$  (> 3 sec.) → Tare position (zeros) of the sensor signal.

#### Position

The display shows the incoming number of revolutions. This value can be scaled in mm, m, etc. by applying a value multiplier in the input counter settings.

Press ESC Key  $\ominus$  (> 3 sec.) → Resetting the revolution counter.

#### Torque / position / speed

The display shows the following values:

- Torque input
- Counter
- Speed

#### Data acquisition

The display shows the following information:

- current mode of measurement data acquisition
- current sensor signal
- sensor signal max.

Press ESC Key  $\ominus$  (> 3 sec.) – MAX-value reset (zeroing) and stop acquisition.

#### Date and time

The display shows the following information:

- current date [day-month-year]
- current time [hour-minute-second]

#### Input /output

The display shows the current status of the inputs and outputs (1- active, 0 - not active). The inputs and outputs are arranged as follows (starting from the left): IN 1, IN2, PK1, PK2





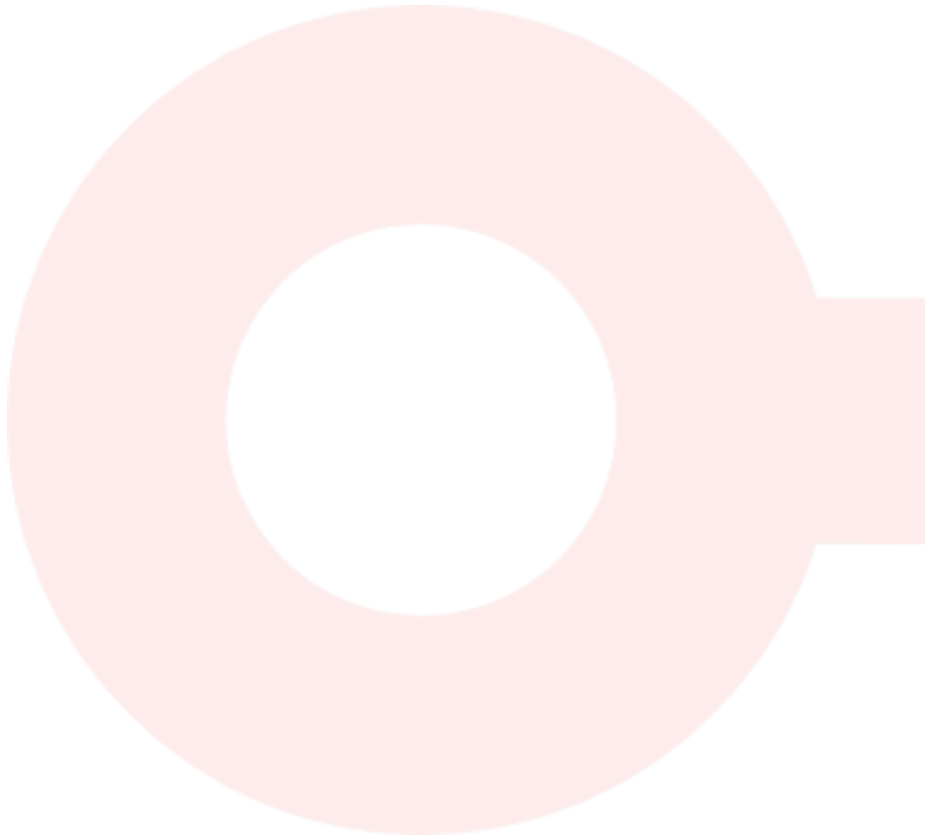
## 4. Menu

To enter the menu, press the  $\leftarrow$  key. To select the individual menus, press the  $\downarrow$  and  $\uparrow$  key, to select further submenus, press the  $\leftarrow$  key, and to exit the selected menu, press the  $\rightarrow$  key.

<b>Settings/Config. input counter</b>		<b>Settings</b>	
$\downarrow$ $\uparrow$	Tare for counter	Reset function of the revolution counter	
	Sensor type	A/B, A	
	Counter for revolutions	0...999999	
	Auto reset	On, Off	
	Offset	-999.9999...+999.9999	
	Multiplier	-999.9999...+999.9999	
	Decimal point position	0.0000...0.0	
Speed units	sec. / min. / h.		
<b>Settings/Config. 0-10 V inputs</b>		<b>Settings for 0...10V (analog)</b>	
$\downarrow$ $\uparrow$	Zero calibration	Removing the input voltage (offset)	
	Offset	-999.9999...+999.9999	
	Multiplicator	-999.9999...+999.9999	
	Decimal point position	0.0000...0000	
	Units	Nm / Ncm	
	Filter [ms]	OFF, 20, 50, 100, 200, 250, 500, 750, 1000, 1250, 1500, 1750, 2000, 2500, 3000, 3500, 4000, 4500, 5000	
<b>Acquired measurement data</b>		<b>Setting options of the measurement data acquisition</b>	
	Acquisition modes	Continuous / WE1 Clock / WE1 Position / Torque input / Angle measurement input / We. 0-10 V	
	Start limit value exceeded	-9999.999...+9999.999	
	Stop limit value exceeded	-9999.999...+9999.999	
	Acquisition times	10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 5 min, 15 min, 30min, 60min	
	Auto reset	YES/NO	
<b>Memory card</b>		<b>Options memory card</b>	
	Information about card		
	Record on map	YES/NO	
<b>Settings/Config. PK outputs</b>		<b>Setting options for relay outputs PK1 and PK2</b>	
$\downarrow$ $\uparrow$	PK1 output		Settings PK1 output
	$\downarrow$ $\uparrow$	Source	Torque input / angle measurement input / 0-10 V input
		Limit value range /ON	-9999.999...+9999.999
		Limit value range /OFF	-9999.999...+9999.999
	PK2 output		Settings PK2 output



	<div style="text-align: center;"> <span>↓</span> <span>↑</span> </div>	Source	Torque input / angle measurement input / 0-10 V input
		Limit value range /ON	-9999.999...+9999.999
		Limit value range /OFF	-9999.999...+9999.999
Main settings		General device settings	
<div style="text-align: center;"> <span>↓</span> <span>↑</span> </div>	Language selection	POLISH/ENGLISH	
	Hour selection		
	date selection		
	displayable information	Torque input / Counter input / Input signal 0...10V / Angle input signal 0...10 V / Acquired measuring data / Date and time / Inputs and outputs / Counter / Speed counter	
	MODBUS address setting	Addresses: 1...254	
	MODBUS transmission rate setting	Speed rate: 19200, 38400, 57600, 115200	
	Input password		
	Factory settings		





### 4.1. Settings – Counter input

Settings of parameters for counter input (A and B signals).

<b>Counter reset</b>	
Resetting the acquired counting pulses of the input counter	
	Reset function end
	Counter remainder and end of function
<b>Input mode</b>	
Setting the counter input mode	
Available modes: <b>A-B</b> - keyboard mode (for protractor), <b>UP-DOWN</b> - mode, <b>DIR-CLK</b> - stepwise/direct mode. For more detailed description of mode setting see chapter 2.4.6.	
	Function end without change transfers
 	Modes selection options
	Change confirmation and menu end
<b>Speed units</b>	
Setting the unit for speed measurement values (frequency) from the counter input.	
Available units: <b>sec</b> - revolution/second, <b>min</b> - revolution/minute, <b>hour</b> - revolution/hour	
	Function end without change transfers
 	Modes selection options
	Change confirmation and menu end

#### Comma position, offset, multiplier

For setting procedures see description under chapter 4.4



#### 4.2. Setting - 0...10 V voltage input

Settings of the parameters for the voltage input.

Input setting	
Removal of the voltage input (offset)	
	Function end
	Change confirmation and menu end

#### Comma position, offset, multiplier

For setting procedures see description under chapter 4.3.

#### 4.3. Settings - offset, multiplier, comma position

Torque, angle measurement values or input voltage can be calibrated independently using multiplier and offset parameters and calculated according to the formula below:

$$\text{VALUE} = (\text{MEASUREMENT} \times \text{MULTIPLIER}) + \text{OFFSET}$$

This makes it possible to convert voltage or angle inputs into another unit (e.g. distance traveled). For example, if a linear sensor with resistance or voltage output is used, it is possible to convert directly from the measured distance in mm to voltage.

Offset/Multiplier	
Settings multipliers/offset (range -999.9999...+999.999)	
	left cursor movement
	Selection options: Decrease/increase parameters Position confirmation End when cursor is at CANCEL position
	right cursor movement

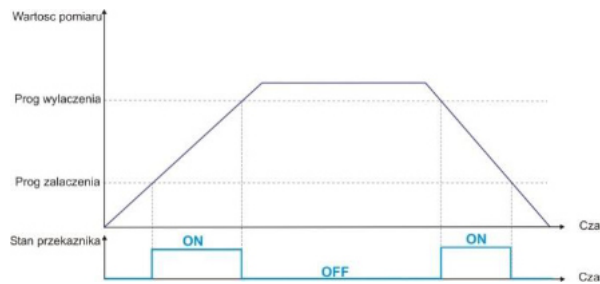
Comma position	
Settings decimal places for displayed values	
	End of function
	Comma shift right / left
	Change confirmation and menu end



#### 4.4. Settings – PK outputs / relay outputs

Enables on/off switching of PK1/PK2 relays.

PK1/PK2 relays can be switched on and off after exceeding values and in case of overload by fixed values, which can be torque sensors, angle measurements and input voltage. The following drawing shows the on/off switching of the relays depending on limit values.



Source	
Selection of an origin signal for on/off switching of the relays	
	Function end
	Selection of data entry source
	Change confirmation and menu end

On/off function for limit range	
Input limit values for on/off function of relays	
	left cursor movement
	Selection options:
	Decrease/increase parameters
	Position confirmation
	End when cursor is at CANCEL position
	right cursor movement



#### 4.5. Measurement data acquisition

Enables settings on the readout unit for recorded measurement data and the recorded minimum/maximum values.

Currently displayed values of torque/angle measurement/voltage input as well as the status of output relays **are independent of** the set measurement acquisition.

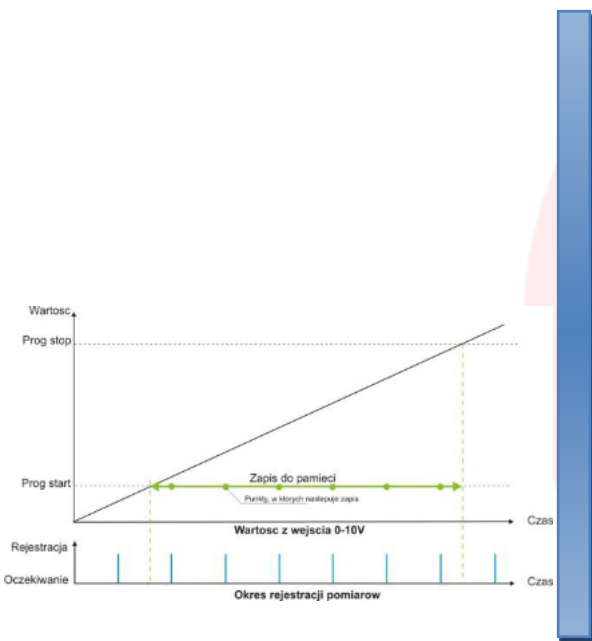
Acquisition modes	
Settings of available data acquisition modes: continuous - data acquisition to a card is independent of WE1/WE2 input status and signal inputs (torque, angle measurement, voltage). The memory acquisition time of the card depends on the "Acquisition time" parameter. WE1 Pulse - At the beginning of the measurement recording, it starts on a high state of at least 1mS on the IN1 input. A recording stop leads to a High state at input IN2. The recording time of the memory card depends on the "Acquisition time" setting.	
<ul style="list-style-type: none"> <li>• <b>WE Status</b> - Measurement data is recorded when IN1 input is high. Recording is stopped when IN1 input is low. The recording time of the memory card depends on the "Acquisition time" setting.</li> <li>• <b>Torque input</b> - measurement data recording start after exceeding the torque value is done by "Start limit value" setting. The measurement stops when the measured values fall below "Stop limit value" or a high state is reached at input IN2. The recording time of the memory card depends on the setting "Acquisition time".</li> <li>• <b>Angle measurement / 0-10V input</b> - Recording after exceeding the angle measurement value/voltage input is done by setting "Start limit value". The measurement stops when the measured value falls below "Stop limit value" or a high state is reached at input IN2. The recording time of the memory card depends on the "Acquisition time" setting.</li> </ul>	
	Function end
	Selection options acquisition mode
	Selection options for data entry mode
	Change confirmation and end of menu

Start/Stop limit	
Adjustable limit values for start/stop for knife-edge sockets. Active for modes: <b>Torque input / Angle measurement / 0...10 V input</b>	
	left cursor movement
	Selection options: Increase / decrease the limit value
	Position confirmation End when cursor is at CANCEL position
	Right cursor movement

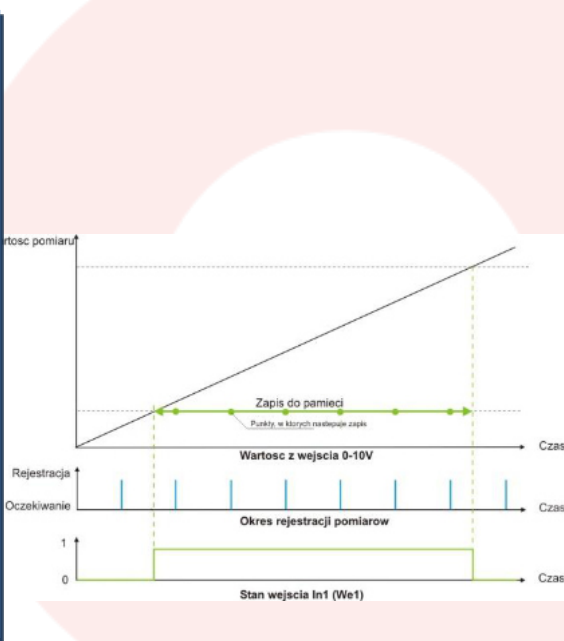


Acquisition time (times for measurement data)	
Setting of the acquisition time with which the data are recorded as well as the current maximum value of the torque input.	
Selectable values: <b>10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 5 min, 15 min, 30 min, 1 h</b>	
	Function end
	Selection options acquisition mode
	Selection options for data entry mode
	Change confirmation and end of menu

Auto Reset (automatic reset)	
Automatic counter reset of input angle and reset of voltage input at start of measurement.	
Active for acquisition modes: <b>WE1 Clock, WE1 Status, Torque Input.</b>	
	Function end
	On/Off Auto-Reset Function
	On/Off Auto-Reset Function
	Change confirmation and menu end



Example of measurement data acquisition in "0-10V input" mode



Example of measurement data acquisition in "1 Status" mode



Regardless of the selected acquisition mode, values of 3 measurement inputs (input torque, input angle and input voltage value) are always recorded.

4.6. General settings

Language selection	
Language selection / Available languages: POLISH/ ENGLISH	
	Function end
	Language selection options
	Change confirmation and menu end

Hour setting	
Hour setting of the built-in clock	
	Left cursor movement
	Selection options:
	Increase/decrease parameters
	Position confirmation
	End when cursor is at CANCEL position
	Right cursor movement

Date setting	
Date setting of the built-in clock	
	Left cursor movement
	Selection options:
	Increase/decrease of parameters
	Position confirmation
	End when cursor is on CANCEL position
	Right cursor movement





Display setting	
Basic settings after switching on the device	
	Function end
 	Possibility to select settings
	Change confirmation and menu end

Password setting	
Password assignment to protect the readout unit from unauthorised persons. The number sequence 0000 switches off the password function.	
	left cursor movement
 	Selection options: Increase/decrease of parameters Position confirmation End when cursor is at CANCEL position
	Right cursor movement

Basic settings	
Reset all settings and restore to factory settings	
	left cursor movement
 	Selection options: <ul style="list-style-type: none"> <li>• Increase/decrease of parameters</li> <li>• Position confirmation</li> <li>• End when cursor is on CANCEL position</li> </ul>
	Right cursor movement



#### 4.7. Memory card

Memory card information	
Information about memory size in MB (megabyte) and available memory capacity	
	Return to menu

Recording to the memory card	
Switching on/off the measurement data recording to the memory card	
	End of function
	Selection options
	Change confirmation and menu end

#### 4.8. Program information

Displays information of name and version of the readout unit.

#### 4.9. RS485 communication parameter

- Default address: 1
- Default baud rate: **38400 b/s**
- Stop bits: **1**, Parity: **none**

#### MG-ME1 registers address table

Address	Name	Data Type	Modbus function number	Description
0	ADC (REAL)	REAL	R (0x03)	Analog data from 0-10 V input.
2	ENC (REAL)	REAL	R (0x03)	Position from encoder input.
6	ADC_MIN (REAL)	REAL	R (0x03)	Min value of analog data.
8	ADC_MAX (REAL)	REAL	R (0x03)	Max value of analog data.
10	ENC_VEL (REAL)	REAL	R (0x03)	Velocity from encoder input.
20	ADC (DIN)	DINT	R (0x03)	Analog data from 0-10 V input
22	ENC (DIN)	DINT	R (0x03)	Position from encoder input.
26	ADC_MIN (DIN)	DINT	R (0x03)	Min value of analog data.
38	ADC_MAX (DIN)	DINT	R (0x03)	Max value of analog data.
30	ENC_VEL (DIN)	DINT	R (0x03)	Velocity from encoder input.

R – read, W – write, REAL (4 bytes), DINT (4 bytes)

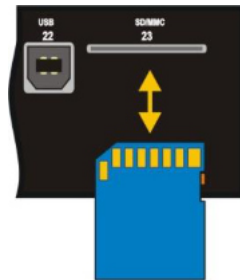
REAL – floating point data type

DINT – signed integer data type



## 5. Memory card

The readout unit can record acquired measurement data on a memory card located on the back of the device. The card is inserted as shown below. To remove the card, simply push it into the device a little in the direction of the arrow until a slight spring resistance is felt, then pull the card out.



Captured data are saved under a file name **csv.txt** according to the following exemplary format overview:

Date [dd-mm-yyyy]	Hour [hh:mm:ss]	Torque input value [cccc.dddd]	Value angle measurement input [cccc.dddd]	Value voltage input [cccc.dddd]
12-02-2010	13:14:36	00230.5400	14612.0000	00006.4500
12-02-2010	13:14:36	00230.5600	14612.0000	00006.4500
...	...	...	...	...
12-02-2010	13:16:26	00630.0000	19602.0000	00000.2200

**Meaning of abbreviations:** dd- day, mm- month, yyyy- year, hh- hour, mm-minute, ss- second, c- complete part of measurement, d - decimal place of measurement.

The values are saved in the format shown in the display, but with a fixed number of decimal places.

## 6. Password

A password assignment provides protection against unauthorised access to the menus. Before using the device, the previously assigned password must be entered. It can only be entered within one minute, after which (or if the input keys are not used within one minute) a new password is required. The universal password is 2491.

Password activation under General settings -> Select "Password", then enter the value 0000.



## 7. PC Program

The readout unit can cooperate with the PC program, which allows settings at PC level. Furthermore, the program allows to collect measurement data in real time and save them as a file (\*.csv → readable by Excel).

The communication of the unit with the PC is done by USB connector, no driver installation is necessary.

You will find help for the setup in the quick start guide of the readout unit.



## 8. Safety and operating instructions

- When using the readout unit under special conditions (e.g. in medicine, in the automation sector, etc.), additional safety regulations require protection against operating errors.
- If the readout unit is used as a panel meter, it must be installed correctly. Failure to do so may result in electric shock.
- Do not connect external devices when the readout unit is in operation.
- Never open or make any modifications to the unit, but contact us for this purpose. Unauthorised modifications may cause electric shocks or fire. In these cases, the warranty will be voided.
- The readout unit is not intended for outdoor use. This can cause electric shocks and severely limit the functionality or cause a complete failure of the device.
- Use ZOAWG brand cables for external power connections.
- Exceeding the specified parameters may cause damage or result in fire inside the unit.
- Do not use products such as water or oil to clean the unit.

- All data without guarantee subject to technical changes -